Human Mars Ascent Configuration and Design Sensitivities

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Abstract—

Human missions to Mars may utilize several small cabins where crew members could live for days up to a couple of weeks. At the end of a Mars surface mission the Mars Ascent Vehicle (MAV) crew cabin would carry the crew to their destination in orbit in a matter of hours or days. Other small cabins in support of a Mars mission would include pressurized rovers that allow crew members to travel great distances from their primary habitat on Mars while unconstrained by time limits of typical EVAs. An orbital crew taxi could allow for exploration of the moons of Mars with minimum impact to the primary Earth-Mars transportation systems. A common crew cabin design that can perform in each of these applications is desired and could reduce the overall mission cost. However, for the MAV, the crew cabin size and mass can have a large impact on vehicle design and performance. The total ascent vehicle mass drives performance requirements for the Mars descent systems and the Earth to Mars transportation elements. Minimizing MAV mass is a priority and minimizing the crew cabin size and mass is one way to do that. This paper explores the benefits and impacts of using a common crew cabin design for the MAV. Results of a MAV configuration trade study will be presented along with mass and performance estimates for the selected design.

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